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## AN ABERRANT LASIUS FROM JAPAN.<sup>1</sup>

WILLIAM MORTON WHEELER.

In a small collection of Japanese ants recently sent me for identification by Professor S. J. Kuwana, of the Imperial Agricultural Experiment Station at Nishigahara, near Tokio, I find a single female specimen of such unusual conformation that I at first supposed it to represent an undescribed genus. On closer examination, however, it proves to be a *Lasius* strikingly different from the females of any of the known species, and suggests two hypotheses for both of which provision will be made in the following paragraphs. The specimen may represent either a new species or merely an aberrant female phase of some one of the known Japanese *Lasii*. The latter supposition will be considered at length in the sequel; the former calls for the following, perhaps merely provisional, taxonomic description:

### ***Lasius spathepus* sp. nov.** (Fig. 1, *A* and *B*.)

*Female* (deälated). Length 6 mm.

Head cordate, slightly broader than long, with notched posterior border and rounded, convex posterior corners and sides; convex above; gula concave, with a median longitudinal ridge. Mandibles small, flattened; apparently 5-toothed, with concave external borders. Clypeus depressed, broadly rounded in front, obscurely carinate in the middle. Frontal area obsolescent; frontal groove distinct. Eyes rather large; ocelli small. Antennal scapes broad and compressed, reaching well beyond the posterior corners of the head; funiculi slender, not clavate; all the joints distinctly longer than broad; joints 1-3 more than twice as long as broad; terminal twice as long as the penultimate joint. Thorax much narrower than the head, fully twice as long as broad; mesonotum and scutellum flattened above; epinotum short, rounded above, with the declivity abrupt, straight in profile and longer than the base. Petiole with an erect scale, compressed antero-posteriorly and with its upper margin rather sharp and distinctly notched in the middle. Gaster very short, but little longer than

<sup>1</sup>Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University. No. 22.

broad. Anal papilla prominent. Legs very long; femora, tibiae and metatarsi dilated and compressed anteroposteriorly; remaining tarsal joints growing successively narrower.

Body and appendages smooth and shining, very finely and inconspicuously punctate. Pleuræ and especially the sides of the epinotum more opaque and somewhat more coarsely punctate. Mandibles opaque, finely and sharply striated.

Hairs yellowish, very short and sparse on the body, denser and more appressed on the flat surfaces of the legs, but absent on the

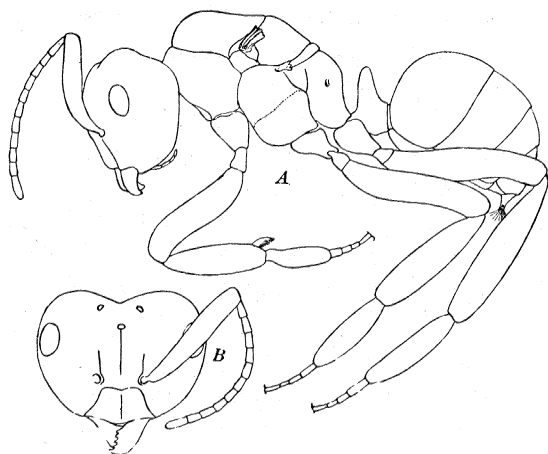


FIG. 1. A, *Lasius spathepus* sp. nov., deallated female; B, head of same.

sharp dorsal and ventral edges of these appendages. Anterior border of clypeus with a row of short, stout bristles. Border of petiole and posterior edge of each gastric segment with a single row of short hairs. Circlet of anal cilia long and coarse.

Body deep chestnut brown; scapes, legs and articulations of wings paler and more reddish; corners of clypeus and posterior borders of gastric segments sordid yellow.

This female may be at once distinguished from any of the known female *Lasii* by its peculiar heart-shaped head, short gaster and dilated and flattened metatarsi. The last character, in fact, is not met with in any other known ant, except *Melisso-tarsus*, which Emery regards as an aberrant Ponerine.

The supposition that *L. spathepus* may not be a new species, but merely an extraordinary female form of some one of the well-known Japanese *Lasii*, is supported by the following considerations. Many years ago Walsh<sup>1</sup> described an aberrant female

<sup>1</sup>"On the Genera of Aphidæ found in the United States," *Proc. Ent. Soc. Phila.*, I., No. 9, 1862, pp. 294-311.

*Lasius* from Illinois as *L. latipes*, and in 1903 McClendon and I<sup>1</sup> showed that this ant has two forms of females: the one described by Walsh and characterized by extremely flat, dilated femora and tibiae, small, feeble tarsi, strongly clavate antennal scapes, short funicular joints and long, fulvous pilosity; and another of a darker color, with less flattened legs, less clavate scapes, longer funicular joints, longer tarsi and sparser, shorter pilosity. The latter we designated as the  $\alpha$ -, the former as the  $\beta$ -female. We found most colonies at the height of the breeding season to contain only  $\beta$ -females, but in three colonies from different localities both forms occurred simultaneously. These observations suggest that *L. spathepus* may be the  $\beta$ -female of some Japanese *Lasius*, which in its worker and male phases shows no departure from the usual generic type of structure. Five *Lasii* are known from Japan, namely, *L. niger* L., *niger alienus* Förster, *myops* Forel, *umbratus* Nyl. and *L. fuliginosus* Latr. All of these are well-known European species and, in all probability, common also throughout temperate Asia.<sup>2</sup> The only one of these species of which *spathepus* could be a  $\beta$ -female is *L. fuliginosus*. I possess males and workers of this species collected by Mr. Hans Sauter in Kanagawa, Japan, and there were three workers in the collection sent me by Professor Kuwana, but as these bear a special number they were probably not taken in the nest containing the *spathepus*. All the Japanese workers and males of *fuliginosus* are indistinguishable from specimens in my collection from several European countries (England, France, Germany, Switzerland, Austria and Russia). In Europe, however, this ant is known to have only one form of female, which is in no respect extraordinary (Fig. 2, *A* and *B*) though it would bear to *spathepus* about the same relation that the  $\alpha$ -female of *latipes* bears to the conspecific  $\beta$ -female. Comparison of the figures accompanying this article shows that the head of *spathepus* in its outline is in some respects more like that

<sup>1</sup>"Dimorphic Queens in an American Ant (*Lasius latipes* Walsh)," BIOL. BULL., IV., No. 4, 1903, pp. 149-163.

<sup>2</sup>*L. fuliginosus* is cited by Forel from lower altitudes in the Himalaya ("Les Fourmis de l'Himalaya," Bull. Soc. Vaud. Sc. Nat., 5 ser., XLII., 1906, p. 85). Du Buysson in a paper which I have not seen ("Les fourmis fuligineuses au Japon," Rev. Ent., 1906, pp. 101-102) gives some notes on the occurrence of this ant in Japan.

of the worker *fuliginosus* than the latter is like that of the European female of the species. If *spathepus* is an aberrant female *fuliginosus*, as seems not only possible, but probable, we must therefore assume either that this species in Japan has two females, comparable to the  $\alpha$ - and  $\beta$ -females of *latipes*, or that it has only the  $\beta$ -female, while the  $\alpha$ -female alone is retained in Europe.

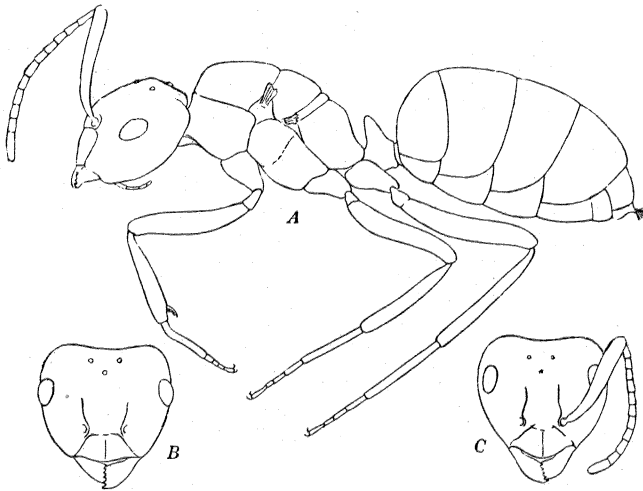


FIG. 2. A, *Lasius fuliginosus* Latr., dealated female ; B, head of same ; C, head of worker.

Evidently this question can be decided only by exhaustive observations in Japan.

The train of hypotheses suggested by *spathepus* is not terminated at this point. Recent investigations make us look with increasing interest on all aberrant female ants, for it has been found that certain species of *Formica*, *Aphaenogaster* and *Bothriomyrmex*—which have females either of unusually small size, glabrous integument, extraordinary color or pilosity, or with unusual morphological characters, also exhibit correlative ethological peculiarities. Such females, during the establishment of their formicaries, are, as a rule, temporary parasites on workers of allied species whose females retain the typical generic characters. The question therefore arises as to whether the aberrant female, which I have called *L. spathepus*, may not be a temporary parasite on some other more common species of *Lasius*. Here the suggestion that *spathepus* may be a  $\beta$ -female of *fuliginosus* receives a little support

from some recent European investigations. Forel<sup>1</sup> long ago showed that this ant is unique among the old world *Lasii* (and the new world species may be included in this statement) in its odor, the great size of its colonies, its habit of foraging in long files in the broad day-light and in constructing carton nests in old tree-trunks. Wasmann<sup>2</sup> has recently called attention to its ability to form new colonies by sending off detachments of queens and workers after the manner of *Formica rufa*. Like *rufa* it also possesses another method of colony formation, namely, through temporary parasitism. Unlike the queens of the common *Lasius niger*, the queen of *fuliginosus*, after fecundation on her marriage flight and on returning to the earth, is unable to start a colony unaided, and if prevented from rejoining the maternal colony or a detachment of workers of her own species, has to seek out a colony of *L. umbratus* and have her young brought up by the workers of this ant. The *umbratus* queen must be killed either by her own workers or by the intrusive *fuliginosus* queen, so that the host species is destined eventually to die off and leave a pure and thriving *fuliginosus* colony. That this method of colony formation is actually adopted by *fuliginosus* queens is clearly indicated by the following observations which have been slowly accumulating during the past few years: In 1908 de Lannoy<sup>3</sup> stated that in 1904 he found at Knoche-sur-Mèr in Belgium a few workers of *L. mixtus* (a subspecies of *umbratus*) living in a large colony of *fuliginosus*, and that in 1906 he found several similar colonies. Emery<sup>4</sup> and Forel<sup>5</sup> interpreted these observations to mean that the queen *fuliginosus* founds her colony with the aid of *umbratus* workers, in a manner analogous to that employed by the North American and European *Formica* of the *rufa*, *exsecta* and

<sup>1</sup>"Les Fourmis de la Suisse," *Nouv. Mém. Soc. Helv. Sc. Nat. Zürich*, XXVI., 1874, pp. 1-447, 2 pls.

<sup>2</sup>"Ueber gemischte Kolonien von *Lasius*-Arten," *Zool. Anzeig.*, XXXV., 1909, pp. 129-141.

<sup>3</sup>"Notes sur le *Lasius niger* et le *Lasius fuliginosus*," *Ann. Soc. Ent. Belg.*, LII., 1908, pp. 47-53.

<sup>4</sup>"Remarques sur les observations de M. de Lannoy touchant l'existence de *L. mixtus* dans les fourmilières de *L. fuliginosus*," *Ann. Soc. Ent. Belg.*, LII., 1908, pp. 182, 183.

<sup>5</sup>"Lettre à la Société Entomologique de Belgique," *Ann. Soc. Ent. Belg.*, LII., 1908, pp. 180, 181.

*microgyna* groups when they enter nests of *F. fusca* and *incerta*. Wasmann (*loco citato*) accepts the interpretation given by Emery and Forel, and now recalls that he has on several occasions found mixed colonies of *L. umbratus* and *fuliginosus*. Donisthorpe<sup>1</sup> states that in 1897 he recorded the occurrence of a large colony of *fuliginosus* in a hollow tree at Lymington, England, living with what he believed at the time to be *L. flavus* but has since decided must have been *umbratus*. He also says that Crawley has recently found *umbratus* workers in company with *fuliginosus*.

But even this is apparently not the whole story. Crawley<sup>2</sup> found that the queen of *umbratus* may be adopted by a colony of *L. niger*, and Wasmann (*loco citato*) has shown that the former ant is, at least occasionally, a temporary parasite on *niger*, for he found a mixed colony of the two species which could only be interpreted on this supposition. He believes, therefore, that we may have here a case of social hyperparasitism—*umbratus* founding its colonies with the aid of *niger*, and *fuliginosus* with the aid of *umbratus*! In these observations it is, of course, the female of the European *fuliginosus* which exhibits temporary social parasitism, and if *spathepus* is really the  $\beta$ -female of this species, it is also, in all probability, addicted to the same form of parasitism, perhaps on some other species of *Lasius*, although *umbratus*, as I have stated, is known to occur in Japan.

Thus it appears that in the old world the genus *Lasius*, like the genus *Formica*, is made up of two sets of species—one extremely abundant and widely distributed, with queens able to establish their colonies independently, the other rare and sporadic in their occurrence, with queens that require the assistance of workers of other species of the genus when engaged in founding their commonwealths. To the former set belong *L. niger* L. and its various subspecies (*alienus* Förster, *brunneus* Latr., *emarginatus* Fabr., *lasioides* Emery) and *L. flavus*; to the latter *L. umbratus* Nyl., and its subspecies *mixtus* Nyl., *bicornis* Förster and *affinis* Schenck, *L. carniolicus* Mayr and *fuliginosus* Latr. The great rarity of *carniolicus* and the very small size

<sup>1</sup>"On the Founding of Nests by Ants; and a few notes on Myrmecophiles," *Ent. Rec.*, XXII., No. 4, 1910, 4 pp.

<sup>2</sup>*Ent. Month. Mag.*, 1909, p. 94.

of its females point unmistakably to parasitic habits. The same is probably true of *L. crinitus* described by F. Smith<sup>1</sup> and Mayr<sup>2</sup> from Cashmir. Only the female of this species is known and this has long yellow hairs like the North American *Formica ciliata* Mayr and *crinita* Wheeler, which are, in all probability, temporary parasites on varieties of *F. schaufussi* or *fusca*.

In North America, the genus *Lasius*, which embraces the subgenus (*Acanthomyops*) not represented in Eurasia, seems to present a corresponding division of its species into those with independent and those with parasitic queens, although the data on which this assertion is based are at present very meager. Here, too, the forms of *L. niger*, namely the varieties *americanus* Emery and *neoniger* Emery, *L. flavus* var. *nearcticus* Wheeler and *brevicornis* Emery establish their colonies independently. This I can affirm from many observations in the field. The same is true of *L. (Acanthomyops) claviger* Roger and probably also of *L. (A.) interjectus* Mayr. But I have never seen any of the females of our *umbratus* forms (*mixtus* var. *aphidicola* Walsh, *subumbratus* Viereck, *minutus* Emery and *speculiventris* Emery) in the act of founding their colonies independently, and it is quite probable that they are temporary parasites on the extremely common *L. americanus*. Equally negative have been my observations on *L. (A.) latipes*, which has the  $\alpha$ - and  $\beta$ -females to which I alluded in a preceding paragraph. That this species is a temporary parasite on *L. americanus* is indicated by the fact that near Colebrook, Conn., I found four small mixed colonies.<sup>3</sup> *L. (A.) murphyi* Forel and *occidentalis* Wheeler, which are closely related to *latipes* and have females covered with singular fulvous hairs, are also very probably to be regarded as parasitic in the early stages of colony formation.

The genus *Lasius*, which comprises some of the commonest and most characteristic ants of the north temperate zone, has never attracted a large number of students, probably because the

<sup>1</sup>"Catalogue of Hymenopterous Insects in the Collection of the British Museum," Pt. VI., Formicidæ, 1858, p. 13.

<sup>2</sup>"Myrmecologische Studien," *Verh. K. K. Zool. bot. Ges. Wien.*, XII., 1862, p. 700.

<sup>3</sup>See Wheeler, "Ants: Their Structure, Development and Behavior," 1910, p. 504, *nota*.



species are in the main subterranean and are so much more monotonous in their habits than the species of *Formica*. Nevertheless, an intensive study of the ethology of the European and North American *Lasii* is bound to bring to light many surprising facts. This is sufficiently indicated in the preceding paragraphs notwithstanding the large amount of conjecture which they contain.